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Combustion Synthesis by Mechanical Alloying

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Scr. Metall. Vol. 23, no. 6, pp. 835-838, June 1989

CuO and Ca powders were mechanically alloyed in a Spex 8000 mixer /mill using a hardened steel vial and three 10 mm diameter tungsten carbide balls. A 10% stoichiometric excess of Ca was used in all tests and the ball/powder mass ratio was 3:1. The vial was loaded and sealed in a dry nitrogen atmosphere. The powders were milled for times up to 24 h. The temperature during milling was measured using a type K thermocouple inserted into a 1 mm diameter hole in the vial cover. The resulting powders were characterised with a Rigaku X-ray diffractometer using CuK alpha radiation and examined in a Philips 505 SEM with an EDAX ultra-thin window X-ray detector attached. The ignition temperature for the reaction without mechanical alloying was measured by embedding a thermocouple in a compacted cylinder of Ca and CuO powders and heating the mixture in a vacuum at a rate of 20K/s until combustion occurred. Graph, photomicrograph. 6 ref.--AA

Descriptors: Copper compounds; Synthesis; Calcium; Metal powders; Mechanical alloying; Combustion; Reaction kinetics; CUPRIC OXIDE; COPPER OXIDE; OXIDES; MICROSTRUCTURES; ELEVATED TEMPERATURE (250-400C); ELEVATED TEMPERATURE; TEMPERATURE; ELEVATED TEMPERATURE (400-850C); HEAT OF COMBUSTION; CHEMICAL PROPERTIES; ENTHALPY; HEAT OF REACTION

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